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A study of 30 cases of scoliosis: Two stage correction

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Abstract
Introduction: Scoliosis is the lateral curvature of spine. It produces body disfigurement and when the deformity is extreme it displace and compress the viscera and also compromises their function. Thereby it may reduce the life expectancy and sometimes produces psychological trauma to the patient. This retrospective and prospective study was carried out in selected group of patients treated for scoliosis in our institute since last 6 years from April 2011 to march 2017.
Methods and Materials: In our institute we had operated more than 100 cases of scoliosis, however minority of patients were treated by anterior release and fusion and second stage posterior surgery. We could get complete follow up of 30 cases of adolescent idiopathic scoliosis and congenital scoliosis which were operated both anterior and posteriorly. All these patients were included in the study. The patients were followed up after discharge at every 6 weeks initially upto fusion and then yearly and before final preparation of this study they were called for the final follow up and the latest status was documented. We used SRS questionnaire – 24 for pre and post-operative status along with other criteria.
Results: Patients in congenital scoliosis presents in the age group of 1-5 years. Patients from 6-10 years usually present for neurological problems and 11-15 years present for onset of acquired idiopathic scoliosis. 15-20 years usually present due to deformity in pre-marital period. In vast majority of patients the chief complain was deformity. Very minor (4/30) number of patients had symptoms of weakness in extremities due to residual poliomyelitis. In our study 3 patients were of the age group 0-10 years, 15 in 11-15 years and 12 patients were belonging to the age group of 15-20 years. Of the 30 patients, 9 were male and 21 were female.
Discussion: Among progressive flexible idiopathic scoliosis curve ranges commonly between 30-75 degrees and with SRS type 2 and 3. In our set up we were able to achieve anterior and posterior arthrodesis with correction of deformity upto 55% in Harrington rod instrumentation and 70% in segmental instrumentation system at immediate post-operative which acts as a boon for most of our patients with idiopathic scoliosis. 5-10% correction was lost at final follow up more in Harrington group when operated for lumbar or high degree of thoracolumbar curves.
Conclusion: Short term good results and reasonable non neurological complication rate in comparison to international series of standard Harrington instrumentation system with our series of 30 patients of two stage correction encourage for further continuation of this complex spine deformity corrective surgery with anticipations to improve from our mistakes, further refinements in surgical technique, longer follow up results, surgeon and patient friendly instrumentation system with final goal of achieving rapid sound anterior and posterior arthrodesis.

Keywords: 30 cases, scoliosis, two stage correction

Introduction
Scoliosis is the lateral curvature of spine. It produces body disfigurement and when the deformity is extreme it displace and compress the viscera and also compromises their function. Thereby it may reduce the life expectancy and sometimes produces psychological trauma to the patient. If it is associated with some congenital anomaly of the spinal cord it may present with progressive neurological deficits.
It is important to evaluate: the extent of scoliotic deformity, primary change that takes place in the spine and its secondary effect on the viscera, spinal cord and disfigurement, for determining the mode of treatment required and eventual outcome of the treatment.
This retrospective and prospective study was carried out in selected group of patients treated for scoliosis in our institute since last 6 years from April 2011 to march 2017.
The study aims at evaluation of two stage surgery for corrective treatment of scoliosis.

Methods and Materials

In our institute we had operated more than 100 cases of scoliosis, however minority of patients were treated by anterior release and fusion and second stage posterior surgery. In last 4 years among 30 patients, 26 patients were of adolescent idiopathic scoliosis and others were of paralytic and congenital variety. We could get complete follow up of 30 cases of adolescent idiopathic scoliosis and congenital scoliosis which were operated both anterior and posteriorly. All these patients were included in the study. The patients were followed up after discharge at every 6 weeks initially upto fusion and then yearly and before final preparation of this study they were called for the final follow up and the latest status was documented. We used SRS questionnaire – 24 for pre and post-operative status along with other criteria. This questionnaire was formatted to assess outcome in deformity correction surgery and included various aspects of patients life including pain self-image, satisfaction to treatment and recommendation of same treatment in future if need arises. For each question multiple possible answers were given and score was given to each answer. Scoring was done in such a way that if given answer worsely affects patients life, it was given the least score of 1 and if given answer indicated that patient was happier in life then it was given the highest score of 5.

Classification system used for scoliosis were:

1. King's
2. Lenke
3. Scoliosis Research society classification.

The most helpful diagnostic tool is xrays. The information used was

Pre operatively – Basic curves and angles, rotation of vertebrae, wedging, disc spaces, ribs, bony congenital anomalies.

Post operatively – correction of deformity and height, fusion status, implant position, pseudo arthrosis, infection.

Erect films include AP and lateral views of the spine which should include a portion of cervical spine proximally and iliac crest distally. Lateral bending films are taken to confirm the extent of degree of flexibility of the spine and to see passive correction of the curve.

Measurement of the scoliotic curve – the most two conventional methods of measuring of scoliosis curve from the AP xray used were – Cobbs and Lippman method.

Thorough history was taken and all the necessary pre-operative investigations were conducted.

Operative treatment:

Stage 1 – Anterior release + fusion

- Exposure – Transthoracic/ Transdiapgragmatic/ Retroperitoneal
- Levels released
- Correction
- Fusion with rib graft or synthetic graft
- Rib preservation

Stage 2 – Posterior fixation + fusion

- Fixation implants – Harrington and/or combined with sublaminar wire at apex or multi hook segmental system
- Fusion – extent, material (rib + iliac graft + synthetic graft)

Combined anterior release and posterior fixation

Immediate post-operative: Degree of correction ad position of implants were found out using immediate post-operative xray finding.

Post-operative protocol

- Bed rest
- Chest physiotherapy
- Mobilization with brace
- Mobilization without brace
- Physiotherapy

Follow up examination

Patients were followed up at 1.5 months, 3 months, 6 months, 9 months, and then yearly after discharge. During follow up clinical as wel as radiological examinations were performed and following examinations were carried out – percentage of correction, status of implants, evaluation of fusion, displacement of hook, bending or breakage of rod, requirement of revision surgery, implant removal.

Results

Patients in congenital scoliosis presents in the age group of 1-5 years. Patients from 6-10 years usually present for neurological problems and 11-15 years present for onset of acquired idiopathic scoliosis. 15-20 years usually present due to deformity in pre-marital period. In vast majority of patients the chief complain was deformity. Very minor (4/30) number of patients had symptoms of weakness in extremities due to residual poliomyelitis.

In our study 3 patients were of the age group 0-10 years, 15 in 11-15 years and 12 patients were belonging to the age group of 15-20 years. Of the 30 patients, 9 were male and 21 were female.

Table 1: Relation with Different Curve Types.

Types	Number of patients	Percentage
Single major lumbar curve	2	6.6%
Single major thoracolumbar curve	14	46.6%
Double major curve	2	6.6%
Single major thoracic curve	10	33.3%
Single major high thoracic curve	2	6.6%
Total number of patients	30	100%

Table 2: According To King's Classification

Type of curve	Number of patients	Percentage
Type 1	8	26.6%
Type 2	5	16.6%
Type 3	12	40%
Type 4	5	16.6%
Type 5	0	0
Total	30	100%

20 patients were operated by Harrington rod instrumentation and sublaminar wiring and 10 patients were operated by multisegmental system.

Table 3: Correction Achieved With Harrington Instrumentation

King type	No. of patients	Pre op Cobbs angle average (degrees)	Post op Cobbs angle average (degrees)	Correction achieved average
Single major lumbar curve	1	40	20	50%
Single major thoracolumbar curve	7	30	13	43.3%
Double major curve	2	38	20	52.63%
Single major thoracic curve	8	40	16	40%
Single major high thoracic curve	2	36	20	55.5%
Total number of patients	30			

Table 4: Correction Achieved With Segmental System.

King type	No. of patients	Pre op Cobbs angle average (degrees)	Post op Cobbs angle average (degrees)	Correction achieved average
Single major lumbar curve	0	-	-	-
Single major thoracolumbar curve	7	65	18	72.3%
Double major curve	1	60	20	66%
Single major thoracic curve	2	65	20	69.2%
Single major high thoracic curve	0	-	-	-
Total number of patients	30			

Table 5: Graft Material.

Graft material used	Number of patients
Isolated iliac graft	5
Iliac graft + rib graft	15
Iliac graft + rib graft + synthetic graft	10

Table 6: Immediate Complications

Complication	Number of patients	Percentage
Neurological deficit	0	
Infection		
With anterior incision	3	10%
With posterior incision	5	16.6%
Skin necrosis		
Superficial	10	33.3%
Flap with infection	3	10%

Table 7: Delayed Complications.

Complication	Number of patients	Percentage
Implant failure		
Hook slippage	2	6.6
Rod disengagement	1	3.3
Screw backout or breakage	1	3.3
Rod breakage	2	6.6
Loss of correction		
<10 degrees	28	93.3
>10 degrees	2	6.6
pseudoarthrosis	4	13.3

26/30 patients were having cosmetic satisfaction with surgical treatment. 4/30 patients felt they were cosmetically same as before surgery status.

Discussion

In this prospective and retrospective study of 30 patients with average follow up of 4 years we have found that this deformity is common in adolescent females. Among progressive flexible idiopathic scoliosis curve ranges commonly between 30-75 degrees and with SRS type 2 and 3. In our set up we were able to achieve anterior and posterior arthrodesis with correction of deformity upto 55% in Harrington rod instrumentation and 70% in segmental instrumentation system at immediate post operative which acts as a boon for most of our patients with idiopathic scoliosis. 5-10% correction was lost at final follow up more in Harrington group when operated for lumbar or high degree of thoracolumbar curves. We felt that segmental system has definitely a better role in such curves.

The amount of correction was more with multi segmental hook fixation system than with Harrington rod system, which is a single rod system and uses only distractive forces to correct and maintain the deformity. Multiple level discectomy are done in anterior release and fusion which helps in getting the correction achieved during the surgery and also helps in getting anterior fusion and elimination of future risk of crankshaft.

Moss Miami system had a less chance of implant failure because it is a double rod system with multiple points of fixation selective of compression and distraction at at segmental levels add to the strength of the construct, while Harrington rod system that we do is a single rod system with two points of fixation which uses only distractive forces without taking into account the compressive forces making the instrumentation weaker and ultimately implant failure occurs.

Loss of lumbar lordosis was more with Harrington rod instrumentation as only distractive forces away from the apex leads to loss of lordosis and contribute to thoracic hypokyphosis in patients when rods were not properly moulded. As compared to the Harrington rod system, segmental rod system requires more skill, more operative time as well as average blood loss is also more with segmental system. But we found neither increase in the infection rate nor any neurological deficit. This signifies that meticulous dissection with adequate tissue respect, following standard principle for hook positioning, pedical screw positioning, rod placing a and rotation maneuvers.

Conclusion

In our series we have noted interesting findings regarding demographics like presentations between 11-17 years of all varieties of curves of scoliosis and their concern regarding future progression particularly in pre-marital age group. Lesser degrees of curves were operated due to poor compliance and social stigma for bracing protocols, patients and patients relatives increase awareness of genera self-image, functional capacity, quality of life and cosmesis rather than pain.

Immediate correction and maintenance is more with multihook segmental system than ith Harrington rod system. In multihook segmental system advantages like increased cosmetic satisfaction, correction of saggital contour, early mobilization and rehabilitation function, less incidence of implant failure and less incidence of pseudoarthrosis. However it requires more stringent pre-operative planning, more surgical skills and operative time and more blood loss. However this system is

particularly useful for complex types of curves like high thoracic, lumbar and double major curves and in revision surgery. However due to high cost and implant related disadvantages we are using simple Harrington system with sublaminar wires near apex at multiple levels in simple type of curves like thoracic and thoracolumbar curves.

Short term good results and reasonable non neurological complication rate in comparison to international series of standard Harrington instrumentation system with our series of 30 patients of two stage correction encourage for further continuation of this complex spine deformity corrective surgery with anticipations to improve from our mistakes, further refinements in surgical technique, longer follow up results, surgeon and patient friendly instrumentation system with final goal of achieving rapid sound anterior and posterior arthrodesis. Objective assessment of patient at various points of time and follow up by SRS – 24 criteria is preferable for better understanding of outcome in individual patient.

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